Method and device for monitoring and storing the properties of various components of a paper/board or pulp and finishing/converting machine

The present invention relates to a method and device for monitoring and storing the properties of various components of a paper/board or pulp and finishing/converting machine and the changes taking place in them and/or the ambient conditions and the changes taking place in them, and for transmitting this data to the control unit of the paper/board or pulp or finishing/converting machine and/or to a separate data processing system.

It should be mentioned that here control unit refers to a control unit at any hierarchical level of the paper/board or pulp and finishing/converting machine, that is, it may be, for example, the machine's central control unit or one of the control units in the machine's decentralised automation system.

Paper/board or pulp and finishing/converting machines comprise a large number of different components which have to be replaced and serviced due to, for example, wear and breakdown. For this reason, instead of using the components proper, temporary components have to be used, components have to be removed from the machine for the duration of servicing the component in question, or an old component has to be replaced by a new one. Often, the properties of temporary, serviced or new components which have an effect on the control values of the machine, do not correspond to the properties of the original component. Such components are, for example, the rolls of the machines mentioned above. For example, when the surface material of a roll wears to such an extent that it becomes too uneven, the roll is usually replaced by a spare roll, in which case the properties of the spare roll do not correspond fully to the properties of the original roll, such as weight, mantle diameter, surface material and deflection.

It is previously known to enter the properties of a new or serviced component in the control unit of the machine in order that the control values of the machine

can be changed, if necessary, to correspond to the said component. This is currently carried out manually, which is laborious. It has also be noted that errors occur in manual entry which, in the worst case, result in the breakdown of the component in question or another component of the machine, or in a change in the quality of the production of the paper/board or pulp or finishing/converting machine due to an incorrect control value.

In addition, the data on the properties of the components, such as data on the diameter of the roll and other dimensional data, are written by hand on the surface of the components, for example, with chalk, or on a separate piece of paper which is attached to the surface of the component, which means that the data on the properties of a component may be lost, for example, during storage or transportation of the component. In such a case, the properties of the component in question have to be measured or determined again.

Furthermore, during transportation, the component may be subjected to, for example, intensive accelerations and impacts. During storage, the component is also often subjected to changes in the ambient conditions, such as temperature and humidity. The properties of, for example, the surface materials of rolls, such as polyurethane, change when subjected to temperature changes. Very often these changes are not noticed until they manifest themselves as disadvantageous changes in the quality of the end product, such as changes in the quality of paper in paper machines. Monitoring and storing the changes taking place in the properties of different components and the ambient conditions and the changes taking place in them per component, for example, during the production run, storage or transportation is almost impossible by using known methods and devices.

The aim of the present invention is to achieve a method and device for eliminating, or at least substantially reducing, the foregoing disadvantages.

To achieve these aims, the method relating to the invention is characterised mainly in that in the component is arranged a memory unit accompanying it, in

which can be written or which can be read electrically, by magnetisation or optically, in which memory unit are stored at least those properties of the components which affect the control values of a paper/board or pulp or finishing/converting machine in connection with the manufacture or servicing of a component in question, before the component is taken for installation into a paper/board or pulp or finishing/converting machine, or taken to be stored for later use, and that data transmission means are arranged for transmitting the data stored in the memory unit to the control unit of a paper/board or pulp or finishing/converting machine and/or a separate data processing system.

The device relating to the invention is, on the other hand, characterised mainly in that in the component is arranged a memory unit accompanying it, in which can be written or which can be read electrically, by magnetisation or optically, in which memory unit can be stored at least those properties of the components which affect the control values of a paper/board or pulp or finishing/converting machine in connection with the manufacture or servicing of a component in question, before the component is taken for installation into a paper/board or pulp or finishing/converting machine, or taken to be stored for later use, and that data transmission means have been arranged for transmitting the data stored in the memory unit to the control unit of a paper/board or pulp or finishing/converting machine and/or a separate data processing system.

Preferred embodiments of the invention are disclosed in the dependent claims.

The invention is described in greater detail in the following, with reference to the appended drawings which show some embodiments of the invention, in which

Figure 1 shows diagrammatically a paper machine roll with a read/write memory unit.

Figure 2 shows diagrammatically a roll in a paper machine, which roll has a read/write memory unit.

Figure 1 shows diagrammatically a paper machine roll 1 and the main principles for monitoring and storing the properties A of the roll 1, the changes taking place in them, and the ambient conditions and the changes taking place in them. Roll 1 is, for example, a calender roll, the mantle 5 of which is coated with a polymer. In the roll 1, preferably in its axle, is arranged a read/write memory unit 2 in which are stored, in connection with the manufacture or servicing of the roll 1, those properties A of the roll 1 which affect the control values of the paper machine 20. Such properties A of the roll 1 are, for example, its diameter, weight, the deflection of the mantle 5, the composition of the surface material of the mantle 5, surface roughness, hours of operation of the roll, and the procedures carried out during the servicing of the roll 1, such as grindings.

The data on the properties A of the roll 1 are stored in the memory unit 2, for example, by means of a separate data processing system 4, such as a PC, located at the service point, from which the data in question on the properties A of the roll 1 are transmitted by the data transmission means 3a to the memory unit 2. Furthermore, the properties A stored in the memory unit 2 can be read in the desired form, for example numerically, by transmitting the data on the properties A of the roll 1 by means of data transmission means 3b to a separate data processing system 4.

The sensors 6, 7, 8 observing the state of the roll 1 and the ambience are in contact with the memory unit 2. The sensors 6 are, for example, piezoelectric power sensors arranged in conjunction with the coating of the roll 1 mantle 5, by means of which sensors is measured the nip force exerted on the roll 1 mantle 5, which force is generated in a paper machine between a roll 1 and a backing roll 1 (not shown). Sensor 7 is a temperature sensor and sensor 8 an acceleration transducer.

Sensors 6, 7, 8 and any other sensors observing the properties A of the roll 1 monitor the changes taking place in them. When a change takes place, for example, in the ambient temperature while the roll 1 is being stored, the

temperature sensor 7 detects the change, which is stored in the memory unit 2 in contact with the temperature sensor 7. Similarly, when the roll 1 is moved, for example, from the place of service to the paper machine 20, the Acceleration transducer 8 detects any impacts that take place during the transfer, which may have a disadvantageous effect on the operating characteristics of the roll 1. The observation of the impact is also stored in the memory unit 2 in contact with the Acceleration transducer 8.

In general, therefore, between the manufacture or servicing of the component and its installation in a paper/board or pulp or finishing/converting machine 20, the properties A of the component and any changes in the properties of the component, ambient conditions and changes B in the ambient conditions are stored in the memory unit 2.

Between the memory unit 2 arranged in conjunction with the roll 1 in connection with the installation of the roll 1 in the paper machine 20 and the control unit 10 arranged in conjunction with the paper machine 20 are provided data transmission means 9a, 9b (Figure 2). By these means, the above-mentioned data stored in the memory unit 2 are transmitted to the control unit 10 where they can be read and processed. If necessary, the data can be transmitted from the control unit 10 to the memory unit 2. The data can be read and processed in a corresponding manner also by means of a separate data processing system 4.

The control unit 10 and the separate data processing system 4 are preferably also connected continuously or temporarily with each other by means of data transmission means 11a, 11b. The foregoing data are transmitted by means of the data transmission means 11a from the data processing system 4 to the control unit 10 and by means of data transmission means 11b from the control unit 10 to the data processing system 4.

Consequently, absolutely correct data on the properties A of the roll 1 are provided, for example, for the control unit 10, and the data do not have to be entered manually as before. This also makes possible the observation or

determination of the state of the roll 1 on the basis of possible memory data B stored in the memory unit 2.

The component preferably also incorporates sensors observing the operating conditions. In the rolls 1 relating to the disclosed embodiment, these sensors are thus, for example, piezoelectric sensors 6 arranged in conjunction with the roll mantle 5 and observing the nip force. The power sensors are also in contact with the memory unit 2, whereby the changes B in the nip force observed by the power sensors 6 are stored in the memory unit 2. Other operating conditions may also be observed by corresponding provision of sensors. It is, for example, useful to observe the operating temperature.

Especially in operating conditions, the properties of the roll 1 (or other component) and its ambient conditions change often, and thus also much data B relating to these changes is stored in the memory unit 2, which means that its memory capacity does not necessarily suffice to store all the data B. In such a case it advantageous to have a "history of events" corresponding to a certain time period stored continuously in the memory unit 2. The memory unit 2 then contains preferably a certain amount of data stored at predetermined intervals from each sensor 6, 7, 8, the data forming for each sensor 6, 7, 8 an essential, continuous "history of events" corresponding to a certain time period. At the same time as data is stored in the memory unit 2, the very oldest stored data is deleted at specific intervals.

It is obvious that the arrangement described above does not apply only to a paper machine roll, but can also be applied to various other components of paper/board or pulp or finishing/converting machines, such as bearings, doctor blades, coating head apparatus, etc. Neither is the provision with sensors limited to concern the type of sensor arrangements relating to the embodiment described above.